

Present scenario of work participation of men and women in agriculture in Odisha and its effect on agriculture production

A

***Thesis submitted to the
Orissa University of Agriculture and Technology
in Partial fulfilment of the Requirement for the degree of Master of
Sciences in Agriculture
(Agricultural Statistics)***

By

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**DEPARTMENT OF AGRICULTURAL STATISTICS
COLLEGE OF AGRICULTURE
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CERTIFICATE I

This is to certify that the thesis entitled "**Present scenario of work participation of men and women in agriculture in Odisha and its effect on agriculture production**" submitted in partial fulfilment of the requirements for the award of the Degree of **MASTER OF SCIENCE IN AGRICULTURE (AGRICULTURAL STATISTICS)** of the Orissa University of Agriculture and Technology, Bhubaneswar is an authentic record of bonafide research work carried out by **Mangaraju Sai Aparna** under my guidance and supervision. No part of this thesis has been submitted for any other degree or diploma.

It is further certified that the evidence and help obtained by him from various sources during the course of investigation has been duly acknowledged.

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CERTIFICATE II

This is to certify that the thesis entitled “Present scenario of work participation of men and women in agriculture in Odisha and its effect on agriculture production” submitted by Mangaraju Sai Aparna, Adm.No.11AS/16 to Orissa University of Agriculture and Technology, Bhubaneswar in partial fulfilment of the requirements for the degree of MASTER OF SCIENCE IN AGRICULTURE (AGRICULTURE STATISTICS) has been approved by the students’ Advisory Committee and the external examiner.

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LIST OF ABBREVIATIONS

UN	-	United Nations
IOM	-	International Organization for Migration
ILO	-	International Labour Organization
GDP	-	Gross Domestic Product
OECD	-	Organization for Economic Cooperation and Development
WEF	-	World Economic Forum
Kg	-	Kilogram
Ha	-	Hectare
Fig	-	Figure
NCRL	-	North Central Regional Library
NRIS	-	Non-resident Indian and person of Indian origin
COEFF	-	Coefficient

ABSTRACT

Work is defined as participation in any economically productive activity with or without compensation, wages or profit. In India according to census 2011 among male workers, other workers constituted a major proportion of 47.20 per cent of total workers. Similarly, among female workers, agricultural labourers constituted a major fraction of 55.21 per cent of total workers but in 2011 census the percentage of female cultivators reduced to 13 per cent and the percentage of agricultural labourer became 57.8 per cent of the total female work force. There is an increase in trend of women agricultural labour force both in India and Odisha .This thesis attempted to describe the present scenario of work participation in states of India and districts in Odisha in relation with agricultural production using the secondary data collected from census of India 1991, 2001 and 2011, Hand book of agricultural statistics. Statistical tools such as graphical representations, descriptive statistics and linear regression model were used. It was observed that Higher work participation rate was observed in Chhattisgarh, Maharashtra, Madhya Pradesh, Bihar and Uttar Pradesh in 1991,2001 and 2011. In Odisha the highest work participation was seen in Malkangiri, Bhargah in 2001 and 2011 and Koraput in 1991. These findings can be concluded that for the major crops (Cereals, food grains, and oil seeds) work participation significantly depends on production but the crop productivity does not depend on work participation in Odisha.

INTRODUCTION

India has a geographical area of 328.73 million hectares in where area under use is 306.04 million hectares. It has been estimated about 140 million of land were planted out of 180 million hectares of farmland and continuously cultivated net area cultivated is about 142.60 million hectares. As per FAO world agricultural statistics, India ranks second largest in production in food grains. Agriculture plays a vital role in Indian economy, where 60 per cent of labour depends on the agriculture and source of income mostly to the rural women. According to World Bank India is home to the fourth largest participation of women in agricultural production.

Present scenario of work participation in India

As per the Census 2001, Indian workforce is over 400 million strong which constitutes 39.1 per cent of the total population of the country. The workers comprise 312 million of main workers and 88 million of marginal workers (i.e., those who did not work for at least 183 days in the preceding 12 months to the census taking) whereas sex differential among the number of male and female worker in the total workforce is significant that the total 402 million workers, 275 million are males and 127 million females. It means that 51.7 per cent of the total males and 25.6 per cent of the total females are workers. The number of female workers is about less than half the number of male workers. In terms of proportion, 68.4 per cent of the workers are males and 31.6 per cent females. The workers have been classified into broad type of economic activity into nine broad categories as per National Industrial Classification, 1998. Distribution of main workers by industrial category shows that agriculture sector still employs largest number of workers. The dependence on agriculture is brought out by the fact that of the 313 million main workers in the country, 166 million (56.6 per cent) has been engaged in 'agricultural and allied activities'.

In India, nearly 70 per cent of the male and 87 per cent of the female workers are dependent upon agriculture, livestock, forestry etc. for their livelihood. Women are engaged in a number of farm operations along with men. Mainly rural women are engaged in agricultural activities in three different ways depending on the socio-economic status of their families and regional factors. Women play a significant and crucial role in agricultural development and allied fields including crop production, livestock production, horticulture, post-harvest operations, agro/social forestry, fishing etc. they are working as paid labourers

cultivators doing work in their own farms managers of certain aspects of agricultural production by, way of labour supervision and the participation in postharvest operations such as application of manure, land preparation, seed grading, sowing, dabbling, planting, irrigation, fertilizers application, plant protection, harvesting, threshing, shelling, hulling, winnowing, cleaning and storing grain, feeding cattle, looking after milch animal, poultry and kitchen gardening are the main occupations of farm women.

Women's labour force participation has stagnated and indeed fallen from 52 per cent in 1990 to 49 per cent in 2016. Women remain half as likely as men to have full-time wage jobs. Those who have paid work earn up to one-third less than men, partly as a result of occupational sex segregation. Women are more likely to engage in low-productivity work and work in informal sector, and they spend at least twice as much time on unpaid domestic work and care activities as men; they contribute significant unpaid work, about 58 per cent, to family enterprises and farms.

As men migrate in search of better-paid work, women in rural India are taking over agricultural work in the villages. They face meager wages, long hours, hazardous work and sexual harassment from the census, amongst rural women, the percentage of marginal workers (defined as working for less than 183 days per year) has increased significantly from 8.1 per cent in 1991 to 14.2 per cent in 2002. During the same period, there was a sharp fall in the percentage of main workers (more than 183 days a year), especially male workers, coming from rural areas. Thus show a casualization and feminization of the workforce in rural areas, with the number of marginal women workers becoming larger and more significant, while male main workers in rural areas have declined.

Present scenario of work participation in Odisha

Agriculture in Odisha continues to be the prime occupation of over 60 per cent people of the state, the share of agriculture sector to the GSDP is declining fast.

The report submitted by the state government to the NITI Aayog said per capita availability of land, water and other resources in the State continue to decline. The state has cultivable area of 61.80 lakh hectares. Cultivators and agricultural labourers are the key persons in growing the food and non-food crops in the field. Thus they may be termed as 'Anna datta'. The agricultural development is highly correlated with their efficiency, skill and

zeal. Where 41.04 lakh cultivators (male-33.75 lakh + female 7.2 lakh) in the state during the year 2011.

The 2001 census registered abnormal fall of both cultivators and agricultural labourers with respect to 1991 by around 12 lakh and 9 lakh respectively. Surprisingly the number of Agricultural labourers has sprang up from 20.98 lakh in 2001 to 67.40 lakh in the year 2011. Agriculture and rural household industry are the two activities in which there is significant female participation in rural areas. It appears because of the compelling circumstances the female participation has gone up in the year. Agriculture is highly labour intensive and we may see that more than one crore persons (62 per cent of the total workers) comprising cultivators and agricultural labourers are working in the field of agriculture.

It is estimated that, rural women are responsible for production of more than 55 per cent food grains and comprise 67 per cent of total agricultural labour force (Shivaram, FAO 1988). A recent estimation by FAO (2011) showed that women agricultural labour consists of 43 per cent of total world agricultural labour force.

In Odisha, according to 2011 census 61.8 per cent of total workers are engaged in agriculture. The percentage of agricultural labourer among total women worker is 57.8 per cent. As Odisha economy is agro-based and a major proportion of women in the labour force work in agriculture. A significant proportion of the labour force in the agricultural sector mostly comprises women. In Odisha, more than 60 per cent of the total workforce is directly dependent on agriculture. According to 2001 census, out of the total male work force 34.15 per cent were male cultivators and 26.39 per cent were agricultural labourers, whereas, the female cultivators and agricultural labourers accounted for 20.11 per cent and 53.90 per cent of the total female workforce respectively.

But in 2011 census the percentage of female cultivators reduced to 13 per cent and the percentage of agricultural labourer became 57.8 per cent of the total female work force. There has been an increasing trend in women agricultural labour force both in India and Odisha. They are employed on small and medium sized farms as well as large industrialized farms and plantations. One of the major characteristic of these women agricultural labour is that most of them being marginal workers i.e. they work for less than 6 months a year. They do not get regular employment. Majority of them are employed on a seasonal and often a casual or temporary basis. Most of these women workers do not receive any form of social security or unemployment benefit

The sharp decline in agriculture production was despite launching of a number of social security schemes and provided for a separate agriculture budget by the state government since 2013-14. Despite the importance on farm mechanization for quality agricultural operations and reduction in cost of production, it is yet to be implemented properly. Paddy remains the highest cultivated crop while cultivation of cash crops like oilseed, pulses, sugarcane, vegetable and fibre is not encouraging

Keeping the above facts, an experiment was undertaken on “Present scenario of men and women in Odisha and its effect on agricultural production”, with the following objectives:

1. To study the district wise scenario of gender participation in agriculture in Odisha using graphical and descriptive statistics
2. To study the effect of work participation of men and women in agricultural production in Odisha by linear regression model
3. To study the state wise scenario of gender participation using graphical and descriptive statistics

REVIEW OF LITERATURE

Chawdhari and Sharma (1961) made an attempt to analyse and reported about the nature of participation of female labour force in agriculture. The participation rate is an increased rate, but the employment opportunities provided to the females is in a decreased rate

Mukerji (1970) who has identified and interpreted the spatial pattern of the varying extents of female participation in rural agriculture labour in Andhra Pradesh. It reveals that there is a striking concentration of rural female agricultural labour in Andhra Pradesh and discussed the main factors, which are responsible for the concentration of these labourers in Andhra Pradesh

Mitra *et al.* (1980) observed the shifts in occupational participation from 1961 to 1971 study also analysed the status of females in the rural society.

Ghosh and Muhopadhyay (1984) reported a drastic reduction in number of female workers and their work participation rates. They explained this situation mainly in terms of the dominant position of the male in the workforce, the low level of overall employment, and the adverse sex-ratio of female in the population. They also examined the issue of inter-state variations in female employment. They found that northern states like Haryana, Uttar Pradesh (UP) and Punjab are characterised by low participation rates and southern states like Tamil Nadu and Kerala show higher participation rates.

Sharma (1984) viewed that the position of Indian women under capitalistic development policy has worsened. She has argued that the proportion of women workforce in the agricultural sector has increased.

Krishnamurthy (1984) discussed that male as well as female agricultural labourers' participation rates on the basis of 1971 and 1981 census and National sample survey. In this study, the author raised two questions that is there any evidence of a relative shift away from agriculture sector and any change in the participation rate.

Agarwal (1985) reviewed the work efficiency of male and female labourers in agricultural tasks, relative wage rates, implications of agricultural modernization for rural women and schemes for improving their economic status.

Arunachalam (1985) observed that in hill regions of North India and Assam, the female workers outnumbered male workers in agriculture. It also analysed the employment and participation rate of female labourers in agriculture

Malik and Giri (1986) aimed at to find out the economic aspects of employment of female labourers in agriculture.

Bardhan (1977, 1989) and Banerjee (1989) made the contention in their study that the nature and dimension of female labour force participation in the country pointed to the fact that a very large proportion of the workers turned as agricultural labourers

Banerjee (1985) argued that there is a declining trend in participation of female labourers in agriculture. It is also aimed to investigate the reason, which affect the declining trend of participation and there is loss of employment in India and Indian states.

Fatima (1991) dealt with the plight of rural agricultural women labourers and stated that the condition of rural women is depends upon the level of employment opportunities available to them.

Agarwal (1997) made an attempt to study the role of women in agriculture. The participation rate of women in agriculture is greater than male and also noticed the status of female workers.

Unni (1997) studied the position of women workers in agriculture. This study is also analysed the wages of these labourers and found that female labourers who entered into work force especially in agriculture as labourers is due to their poverty and indebtedness.

Joshi (1999) studied the productivity of female labour is very low in agriculture sector. At 1980-81 price in 1950-51, the productivity for labour was Rs.2305 which increased to Rs.2794 and further increased to Rs.3157 in 1990. Thus productivity of women agriculture labour is very low compared to other sectors.

C.U. Thesia (2004) in his paper pointed out some very important issues of women agricultural workers are gender discrimination, working conditions and health status

Vepa (2005) studied that women are mainly wage labour they are also as main workers, marginal workers in agriculture

Brohi (2005) in his research paper entitled “NDP irrigation Reforms Lack Gender Equality” argued that despite gargantuan efforts and uncasing participation in socio-economic field, women role has been discarded.

Damisa *et al.* (2007) found that the level of the disposable income, tenure rights and the level of the contribution of women to agriculture are the key determinants of women participation in agriculture production.

Mallaiah (2007) studied that women workers are in general classified as those belonging to the organized and unorganized sectors. The economic condition of women are obvious from the fact that 94 per cent of them are found in unorganized sector leaving only 6 per cent in the organized sector. Out 94 per cent of the female labourers found in the unorganized sector nearly 80 per cent belong to agriculture.

Charles and williem (2008) opined that the importance of the role played by women in agriculture production is such that the wide spread failure so, far to reach women farmers through formal extension services has major repercussions for national output and food security as well as social justice.

Mazumdar *et al.* (2009) observed that, in case of agricultural activities women labourers are mainly involved in homestead gardening, harvesting and post-harvesting operations. The most important factor for seeking employment or involvement in various activities by the women is to meet family needs followed by increasing family income.

Klasen and Lamanna (2009) used two measures of labour force participation female share of total labour force and the ratio of female to male economic activity rates for 93 countries, covering 1960-2000. The study resulted to broadly suggest a negative impact of gender discrimination.

Butt *et al.* (2010) highlighted the role of women in agriculture development and concluded that male dominance, traditional belief systems, extension education services, lack of mobility & technical training, knowledge & skills are the major constraints for female agricultural workers.

Aruna (2010) studied that women agricultural workers are finding it harder to shift out of agriculture than men, and their stake is increasing in a sector that is riddled with adverse economic conditions and where they have little rights, authority, access to or control of resources required for enhancing production and household income

Bala (2010) cited in his working paper regarding engagement and participation of women workers in almost all activities of agriculture but there is discrimination in wages even if they do same type of work as male labour. Further despite of their extensive and active involvement in agriculture India, they are not considered for decision making in farm activities.

Butt *et al.* (2010) highlighted the role of women in agriculture development and concluded that male dominance, traditional belief systems, extension education services, lack of mobility & technical training, knowledge & skills are the major constraints for female agricultural workers.

Bhalla and Kaur (2011) identified that India has one of the lowest labour force participation for women in the world more accurately, one of the lowest rate for urban women. "Female education has a positive impact on labour force participation rate".

Lal and Khurana (2011) compared the important role played by the women in agriculture and the gender discrimination and its negative impact on socio-economic status of women

Doss *et al.* (2011) in their working paper have observed that the Agriculture sector is under performing in many countries because women who are often a vital resource in agriculture and the rural economy face constraints that reduce their productivity. With the help of time use surveys they have found that there is substantial heterogeneity among countries and within countries in women's contribution to agriculture. They showed that female time use in agriculture varies also by crop, production cycle, age and ethnic group. For these diversities, they have suggested that policies must be based on sound data and gender analysis.

Dhaka *et al.* (2012) women participation in agriculture will be acknowledged when women farmer will actively participate to build and improve their knowledge and again access to knew and necessary information to make use of most of them in their farming activities. By linking the knowledge and information flow amongst women socio-economic progress can be achieved.

Singh and Vinay (2012) briefed about the significance of female labour in agriculture and allied activities. They further stated that the role of women in agriculture as female labour is not highlighted in India. Despite of their presence in activities sowing, transplanting and post-harvest operations they are considered as an invisible workers

Dave (2012) conducted the study on women workers engaged in unorganized sector to know about the socio-economic background, working conditions, wage rates, living conditions of women workers engaged in unorganized sectors like construction, domestic and agriculture in three districts of Haryana. She conclude that women labours face problems like excessive work burden ,wage discrimination, exploitation, untimely wage payment, seasonal unemployment, job insecurity, health problems

Mandal (2013) analysed women participation in agricultural production of Sagar Island, West Bengal, India. He investigated that women perform range of duties at farm and home, also they work for longer hours than men and yet they get less wages and exploited by landlords. They are treated as sub-servant and discrimination is there for female labours.

Rahul and Hema (2013) studied about the economic growth and female labour force participation in India. The decline in female labour force participation in India is not part of the “Normal” development process which will reverse itself with more growth, and has been experienced by some other countries.” “Agriculture and manufacturing sectors are typically labour intensive but have not led the overall economic growth in India.”

Archana (2013) identified that the drop in agricultural employment shows that the agricultural workers have been compelled to seek work in the casual labour market.

Budech (2014) studied about the struggles of female farm workers of California. He investigated the gender aspects of fieldwork and few specific struggles faced female farm workers such as domestic abuse, sexual harassment in the fields, and exposure to pesticides.

Mugadur and Hiremath (2014) found that women face many problems like illiteracy, low and irregular wages that women do not know how to face these problems.

Kapsos *et al.* (2014) attributed the decline in female labour force participation at the rising number of females in the age group of 15-24 attending educational institutions, an increase in house hold income levels, and the measurement issue in capturing female work in NSSO surveys. The next section explores the effect of the factors on female labour force participation.

Kanagrathinam (2014) investigated that around 52% of unorganized workers are engaged in agriculture and allied sectors. Agricultural sectors have advantages in rural groups such as small, subsistence farmers, tenants and share croppers, the unemployed and the land less. They get very low and irregular wages, wage discrimination between male and females, no

public holiday and no standard daily working hours. In addition they have very poor working conditions, lack of dignity, seasonal unemployment and harassment issues.

Das (2015) studied about work participation of women in agriculture in Odisha and concluded that women are concentrated in the agricultural sector of labour market. There is discrimination against female labours because women labour power is considered as unskilled and inferior.

Swamikannan and Jeyalakshmi (2015) study about labour in Indian agricultural sector and found that female work participation rate has declined drastically during last few decades which shows that female workers are moved from agricultural to non agricultural activities because wage differences between male and female workers for the same type of work discourages female workers

Valipour (2014, 2015) also used the important indices of rural population to total population and total economically active population in agriculture to total economically active population to estimate the values of area equipped for irrigation

Multani and Sanghvi (2017) studied that in some parts of the nation women workers are being paid less than the male workers and position of women workers in agricultural sector.

MATERIALS AND METHODS

The Research methodology is a way to systematically solve the research problem. It is the structural configuration of the study for conducting research within the frame work of the objectives. It includes methods, tools, techniques and approaches for any research work.

This chapter deals with the methods, measurements and procedures are as following

3.1 Location and agriculture profile of the study area

3.2 Sources of the data collected

3.3 Statistical tools used for analysis

3.4 Terms used for proper interpretation of data

3.1 Location and agriculture profile of the study area

3.1.1 Odisha state

The present study was conducted in the state of Odisha, which is located in the subtropical belt in the south eastern region of India between 17° 31" and 22° 31" North latitude and between 81° 31" and 87° 30" East longitude.

The state is bounded by the states of Bihar and Jharkhand in the North, West Bengal in the North-East, Chhattisgarh in the west and Andhra Pradesh in South. The Bay of Bengal has a long coast of 484 kms at the East of the state. In terms of area, it is the 10th largest state in India covering an area of 155.4 lakh hectares.

Odisha has 30 administrative districts, 30 agricultural districts and 314 development blocks covering 51,639 villages. The whole state is divided into 10 agro-climatic regions. The state lies in the subtropical belt of medium pressure. The summer is hot and dry and is followed by wet and humid rainy season. The autumn is pleasant and winter is short and mild.

In general it has the climate characterized by high temperature and medium rainfall. The average rainfall of the state is 1490 mm with 73 rainy days of which about 75% is received in the rainy season of mid- June to mid-October.

3.1.2 Agricultural profile of the Odisha

Odisha is primarily an agrarian economy. About 61.8 per cent of total main workers are engaged in agriculture including 23.4 per cent cultivators and 38.4 per cent agricultural labourers (2011 census). The total cultivated land of the state is 61.80 lakh ha, out of which 29.14 lakh ha (47 per cent) is highland, 17.55 lakh ha (28 per cent) medium land and 15.11 lakh ha (25 per cent) lowland.

About 35 per cent of cultivated land is irrigated and rest 65 per cent is rain fed, which are exposed to vagaries of monsoon. Cropping intensity is 166 per cent during 2011-12. Majority of the farmers are small and marginal and have limited purchasing power with low levels of literacy. The number of operational holdings of the state is 43.56 lakh with 50.19 lakh ha of operational area as per Agricultural Census-2005-06. The state witnessed a decline in operational area from 50.81 lakh ha in 2000-01 due to urbanization and more of land put to non-agricultural use. So the average size of holding for all social groups in the state has decreased to 1.15 ha as against 0.83 ha for SC and 1.24 ha for ST category of farmers.

Agriculture sector provides employment to more than 70 per cent of total work force, directly or indirectly, making it largest employment sector of the state. In Odisha, sugarcane cultivation has been widely accepted by the farmer. Crops like Rice, pulses, oilseed, jute, sugarcane, coconut and turmeric are important crop.

3.2 Sources of the data collected

The data was collected from the Census of India (1991, 2001 and 2011) of work participation in agricultural production. Regarding the area, production, productivity the data was collected from the Hand book of agricultural statistics in Odisha, Directorate of agriculture and food production, Odisha.

3.3 Statistical tools used for analysis

3.3.1. Graphical representation is another way of analysing numerical data. A graph is a sort of chart through which statistical data of work participation is analysed from the three years 1991, 2001, 2011 to know the trend and work participation of men and women with respect to both rural and urban areas in agriculture production.

3.3.2. Percentage analysis was used in the descriptive statistics for making simple comparisons. In order to calculate percentage of in that particular category to which the percentage of total workers (main and marginal) to total population. This has been used in the study and proved helpful in organizing the data clarity and precision.

3.3.3. Linear Regression Analysis

Linear regression attempts to model the relationship between two variables by fitting a linear equation to observed data. One variable is considered to be an explanatory variable, and the other is considered to be a dependent variable

A linear regression line has an equation of the form

$$Y = a + bX,$$

where X is the explanatory variable

Y is the dependent variable.

The slope of the line is b and a is the intercept (the value of y when $x = 0$). Here, Y represents the agricultural production and X is the work participation of men and women. The significance of the p - value was judged by calculating their respective values and 5% and 1% level of significance.

Microsoft Excel was used for analysing the relationship between the dependent and independent variables the following steps are used for regression analysis

Step 1: Select DATA ANALYSIS from data option of the menu bar.

Step 2: Select REGRESSION option

Step 3: Insert the dependent data in the Y input range and independent data in X input range

3.4 Terms used

Work

Work is defined as participation in any economically productive activity with or without compensation, wages or profit. Such participation may be physical and/or mental in nature. Work involves not only actual work but also includes effective supervision and direction of work. It even includes part time help or unpaid work on farm, family enterprise or in any other economic activity. All persons (irrespective of age and sex) who participated in any economically productive activity for any length of time during the reference period are defined as workers. Reference period for determining a person as worker and non-worker is one year preceding the date of enumeration

Main Workers

Workers who worked for more than 6 months (180 days) in the reference period are termed as Main Workers.

Marginal Workers

Workers who worked for less than six months (180 days) in the reference period are termed as Marginal Workers. Marginal workers are further bifurcated into two categories i.e. those who worked for 3 months or more but less than 6 months and those who worked for less than 3 months.

Non Workers

A person who did not work at all in any economically productive activity during the last one year preceding the date of enumeration was treated as non-worker. This category includes students, persons engaged in household duties, dependents, pensioners, beggars, etc.

provided they were not engaged in any economically productive activity during the last one year preceding the date of enumeration

Cultivators

If he or she is engaged in cultivation of land owned or held from Government or held from private persons or institutions for payment in money, kind or share. Cultivation includes effective supervision or direction in cultivation. A person who has given out her/his land to another person or persons or institution(s) for cultivation for money, kind or share of crop and who does not even supervise or direct cultivate on land, is not treated as cultivator.

Agricultural Labourers

A person who works on another person's land for wages in money or kind or share is regarded as an agricultural labourer. She or he has no risk in the cultivation, but merely works on another person's land for wages. An agricultural labourer has no right of lease or contract on land on which she/he works.

Work Participation Rate

Work participation rate is defined as the percentage of total workers (main and marginal) to total population.

$$\text{Work Participation rate} = \frac{To(\text{Main} + \text{Marginal})}{\text{Total Population}} \times 100$$

RESULTS

A study on “Present scenario of work participation of men and women in agriculture in Odisha and its effect on agriculture production” was done by collecting the secondary data for gender participation in agriculture from census of India during the years 1991, 2001, 2011 with the objectives set for study. Accordingly the data collected and analyzed by using suitable statistical tools and techniques as indicated in the preceding chapter dealing with research methodology. The findings of the study were presented in this chapter as per the objectives outlined. The data obtained in the study were processed, analyzed statistically and presented with the help of the graphs and tables systematically.

The findings were made using the following objectives:

1. To study the district wise scenario of gender participation in agriculture in Odisha using graphical and descriptive statistics
2. To study the effect of work participation of men and women in agricultural production in Odisha by linear regression model
3. To study the state wise scenario of gender participation using graphical and descriptive statistics

4.1 To study the district wise scenario of gender participation in agriculture in Odisha using graphical and descriptive statistics

4.1.1 Total workers in agriculture in Odisha

From the figure 4.1.1, we observed the trend of total workers in Odisha. The raise in number of workers from the year 1991 (8 million) to 2011 (10 million) in both rural and urban was noticed that more number of agricultural workers are present in rural than in urban.

4.1.2 Total Population involved in agriculture

Figure 4.1.2 shows that work participation of the total cultivators and agricultural labours belonging to marginal and main workers over the total population involved in agriculture has been observed from 1991 to 2011 showed that the male workers were

decreased from (43.65 per cent) to (38.20 per cent) in the year 2011 in rural areas and the female workers were increased up to (22.62 per cent) the year 1991 to 2011 in rural areas.

4.1.4 District wise scenario of work participation in agriculture

In 1991 the work participation is higher in Koraput district and lowest in Cuttack and in the year 2001 the work participation is higher in Malkangiri, Nabrangpur and Gajapati district where as in Khorda district has lowest work participation compared to 1991 and 2001 the workers in agriculture increase in 2011 up to more than (60 per cent) of work participation involved in agriculture in districts of Malkangiri, Nabrangpur, Naupada, Baudh and Bargarh.

4.1.3 Work participation of men and women as cultivators and agricultural labours

From the figure 4.1.3 The relationship between the men and women workers as cultivators and agricultural labours during the years 1991 and 2011 are compared, figure 4.1.3 showed that male cultivators and female cultivators decreased from (4 million) to (3 million) in rural area and (0.8 million) to (0.7 million) in urban areas in 1991 to 2011.

In case of agricultural labours male and female workers in 1991 are increased from (1 million) to (3 million). In the year 2011 male workers remain the same but females workers increased from (0.03 million) to (0.04 million)

4.1.1 Trend of workers in agriculture in Odisha

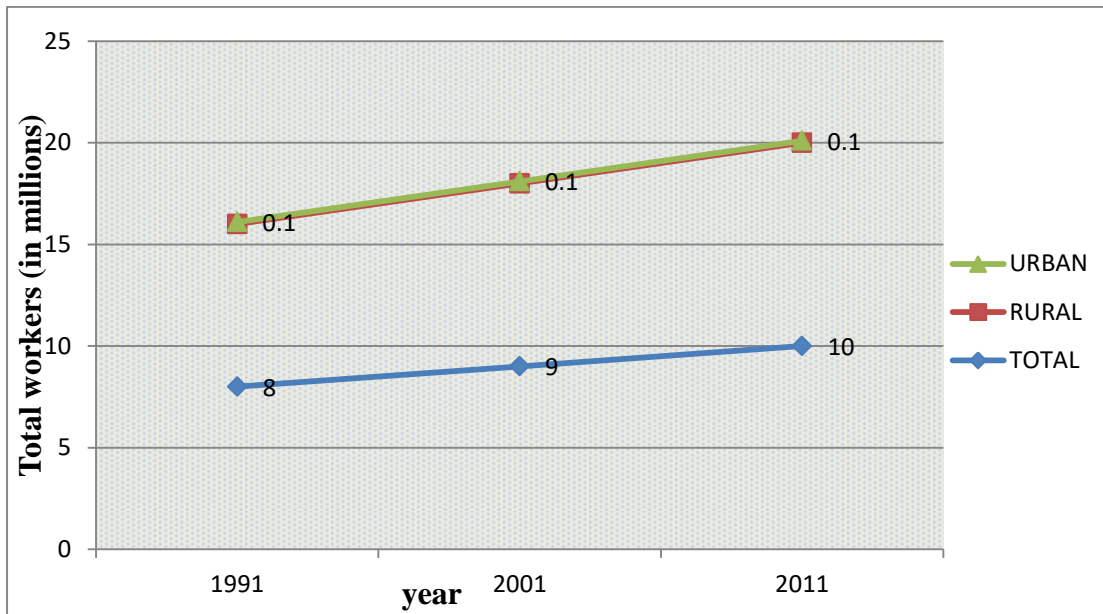


Fig 4.1.2 Total Population involved in agriculture

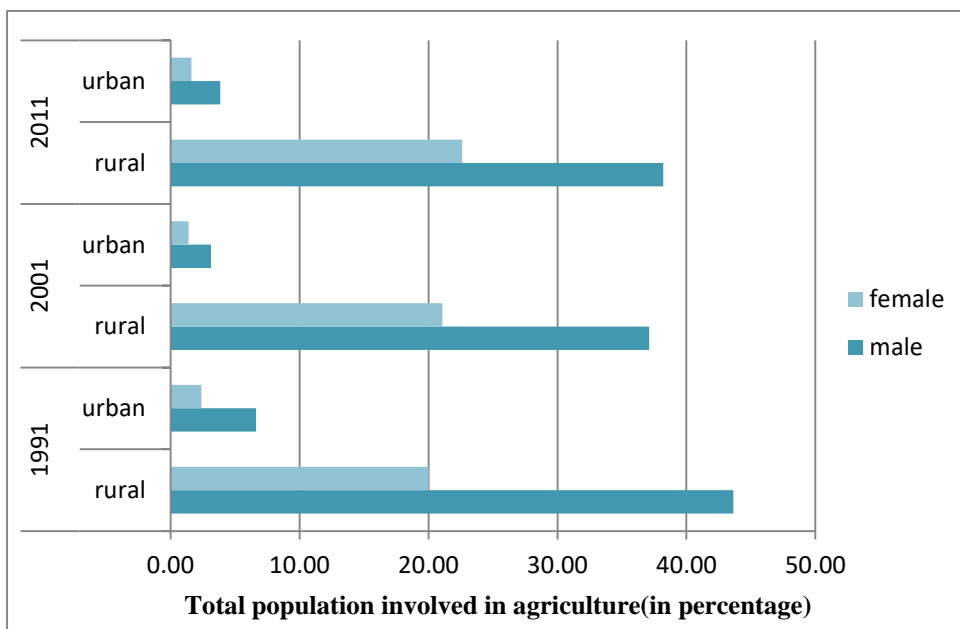


Fig 4.1.3 Work participation of men and women as cultivators and agricultural labours

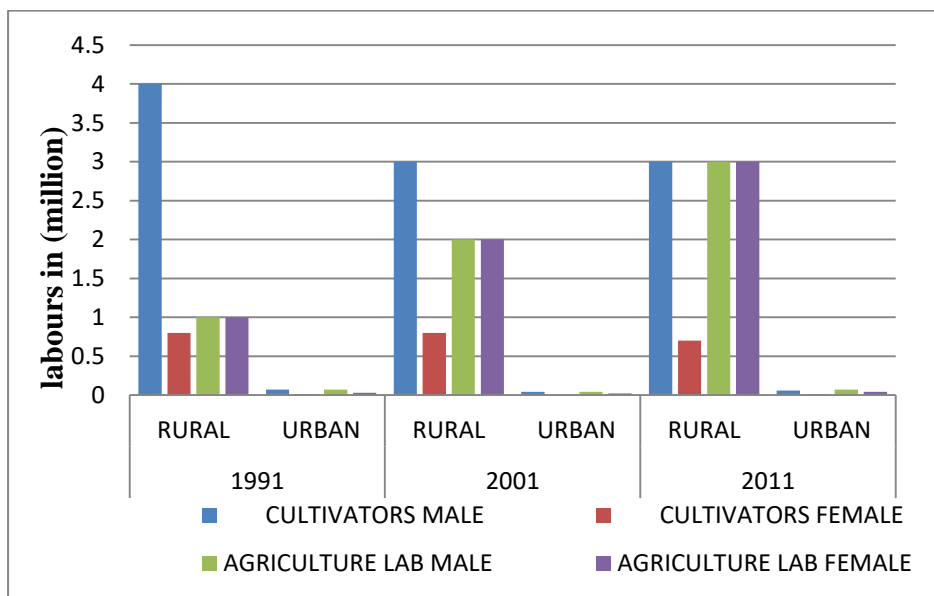


Fig 4.14 District wise scenario of work participation in 1991

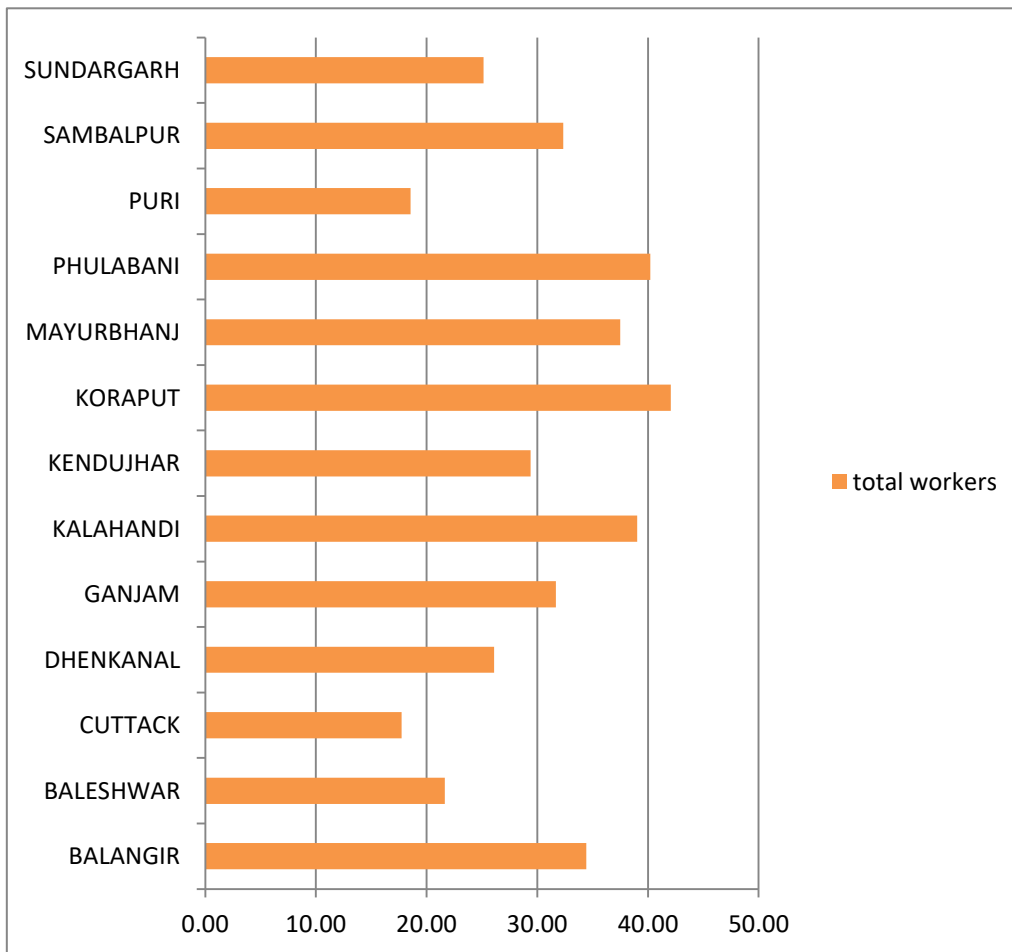


Fig 4.15 District wise scenario in work participation in 2001

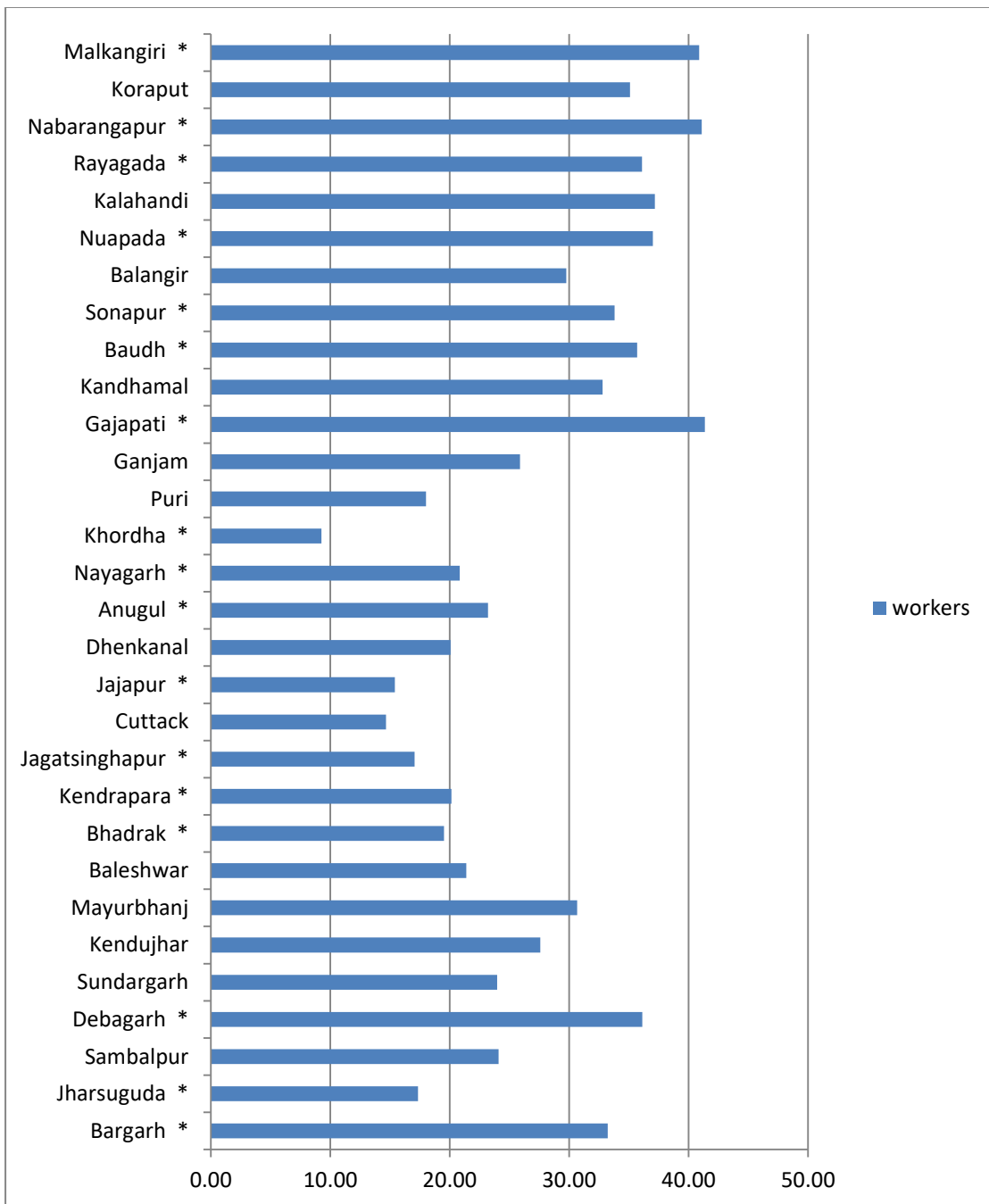
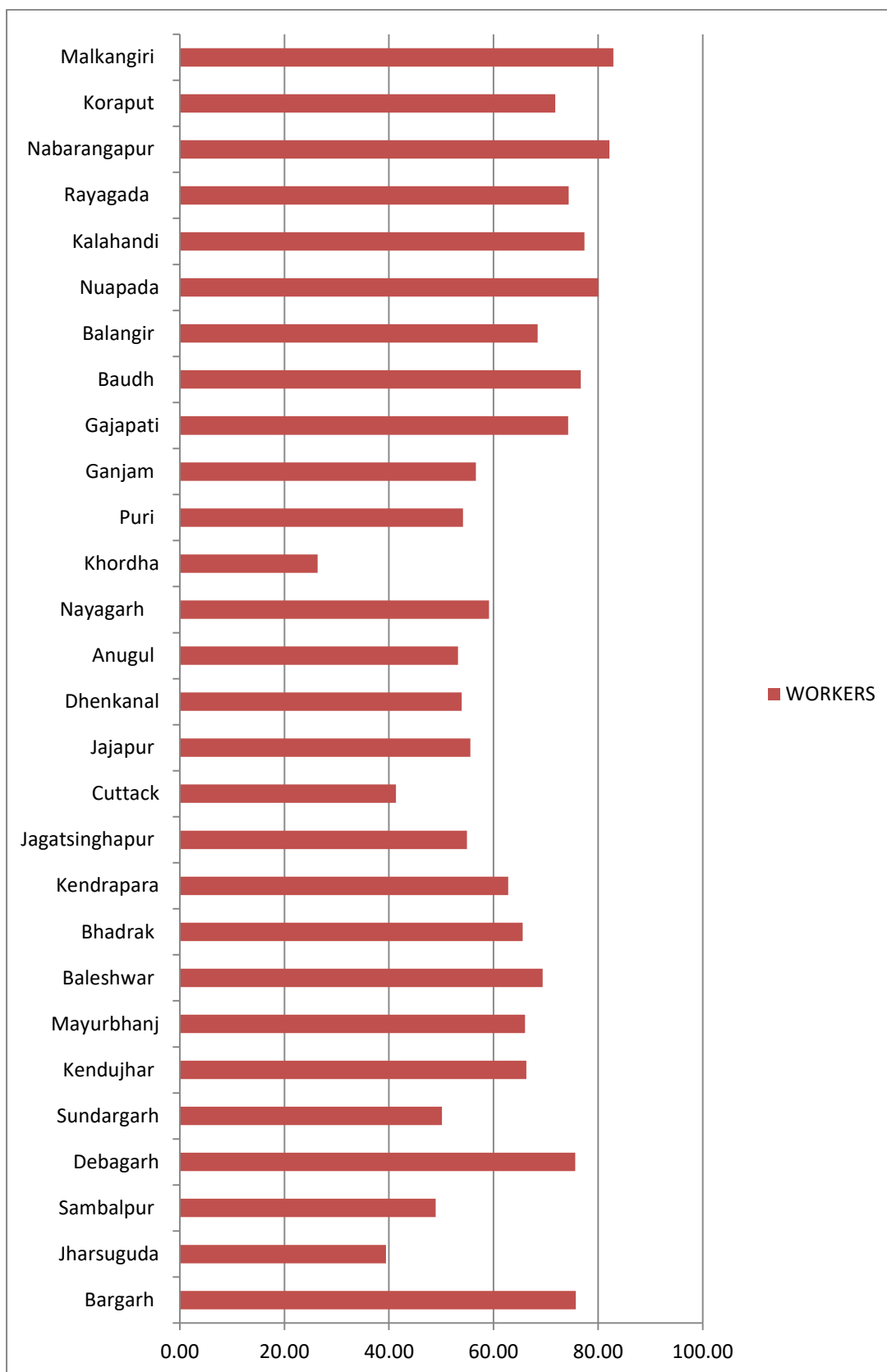


Fig 4.16 District wise scenario in work participation in 2011



4.2 Objective-2: To study the effect of work participation of men and women in agricultural production in Odisha by linear regression model

Linear regression, also known as simple linear regression or bivariate linear regression, was used to predict the value of a dependent variable based on the value of an independent variable. Variables like number of workers, production and productivity of crops of major crops (cereals, food grains, oilseeds) were used to study the relationships. In case of simple regression analysis, number of workers of agriculture considered as dependent variable and production and productivity as independent variables. Here the results are presented in graphs and tables Linear regression analysis of agricultural production (year) and the work participation in agricultural production in district wise in Odisha

Table 4.2.1 MODEL SUMMARY OF TOTAL WORKERS VS PRODUCTION

CROPS	TOTAL WORKERS VS PRODUCTION		
	2011		
	COEFF	P-VALUE	ADJUSTED R²
CEREALS	0.0352*	0.0159	0.1615
MAIZE	0.12*	0.0333	0.13
FOODGRAINS	0.0308*	0.0218	0.1444
PULSE	0.0561	0.5520	-0.0224

TABLE.4.2.2MODEL SUMMARY OF TOTAL WORKERS VS PRODUCTION

CROPS	TOTAL WORKERS VS PRODUCTION		
	2001		
	COEFF	P-VALUE	ADJUSTED R²
CEREALS	0.0200	0.7829	0.0046
MAIZE	0.4747*	0.0281	0.1353
FOODGRAINS	0.4666*	0.0270	0.1328
PULSE	0.1232	0.5869	-0.0255
OIL SEEDS	0.0091	0.955	-0.0355

Table 4.2.1 and 4.2.2 indicates that the relationship between total workers and production of major crops (cereals, oilseeds, food grains) in 2001 and 2011 has significant relationship with in 2011 whereas production of none of the crops were found significant in 2001 except production of maize. These results confirm that increase in number of workers in agriculture does not have any significant effect on production of major crops in different districts of the state.

TABLE 4.2.3 MODEL SUMMARY OF TOTAL WORKERS VS PRODUCTIVITY

CROPS	TOTAL WORKERS VS PRODUCTIVITY		
	2011		
	COEFF	P-VALUE	ADJUSTED R²
CEREALS	13.8163*	0.0333	0.1215
MAIZE	0.1157	0.29547	0.004
FOODGRAINS	0.0158	0.008	0.9152
PULSE	0.615	0.5253	-0.0213
OIL SEEDS	0.0091	0.038	0.1139

TABLE.4.2.4 MODELSUMMARY OF TOTAL WORKERS VS PRODUCTIVITY

CROPS	TOTAL WORKERS VS PRODUCTIVITY		
	2001		
	COEFF	P-VALUE	ADJUSTED R²
CEREALS	0.0441	0.1012	0.0606
MAIZE	0.0134*	0.0224	0.1430
FOOD GRAINS	0.1157	0.2947	0.0048
PULSES	3.2074*	0.0469	0.1063
OIL SEEDS	-0.0099	0.1260	0.0487

Table 4.2.3 and 4.2.4 indicates that the relationship between total workers and productivity of major crops (cereals, oilseeds, food grains) in 2001. Significant relationship with in 2011 whereas productivity of none of the crops were found significant in cereals and oilseeds in 2011 and maize and pulses productivity in 2001. These results confirm that increase in number of workers in agriculture does not have any significant effect on productivity of major crops in different districts of the state.

4.2.2 Linear regression of cereal production and total workers

From the graph 4.2.2.1 we observed the steady increment in total workers which act as dependent variable with the increase in production of crops like cereals, pulses, food grains, oilseeds as independent variable in both the years 2001 and 2011.

Graph 4.2.2.2 maize production we observed the showed relationship between the increased production of maize as independent variable and dependent variable total workers

Graph 4.2.2.3 food grain production and total workers we observed the steady increment in total which act as dependent variable with the increase in production food grains, as independent variable in both the years 2011

Graph 4.2.2.4 and 4.2.2.5 maize productivity and pulse productivity in the year 2001 the total workers as dependent variable we observed the relationship between total workers acts dependent and productivity as independent variable

Graph 4.2.6 cereal productivity of 2011 total workers observed the relationship between total workers act as dependent and productivity as independent variable.

Fig. 4.2.2.1 Linear regression of Total workers and cereal production in 2011

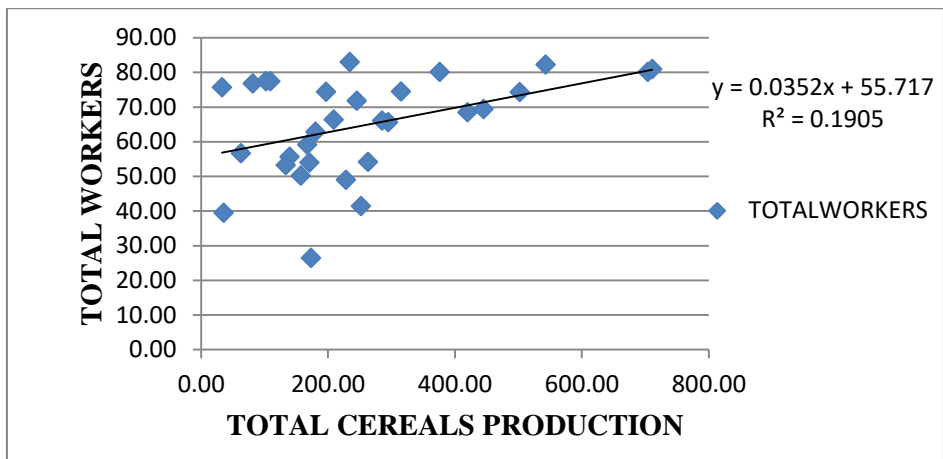


Fig. 4.2.2.2 Linear regression of Total workers and maize production in 2011

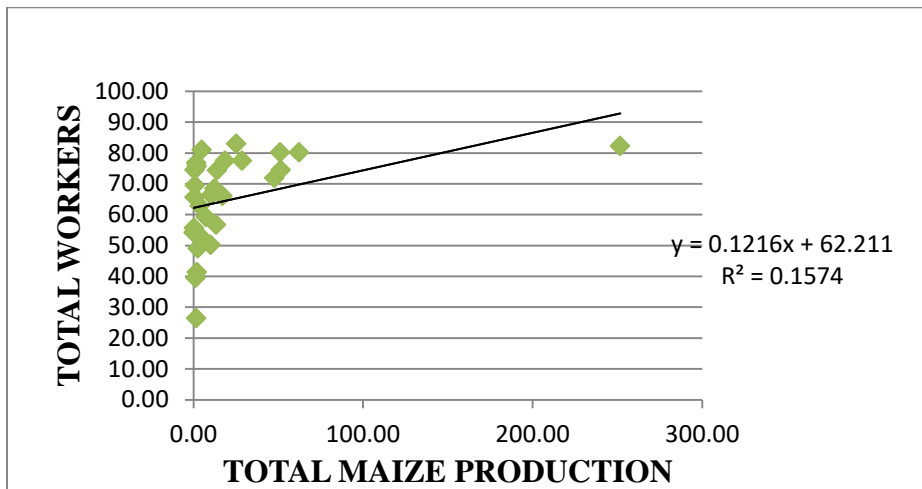


Fig.4.2.2.3 Linear regression of Total workers and food grain production in 2011

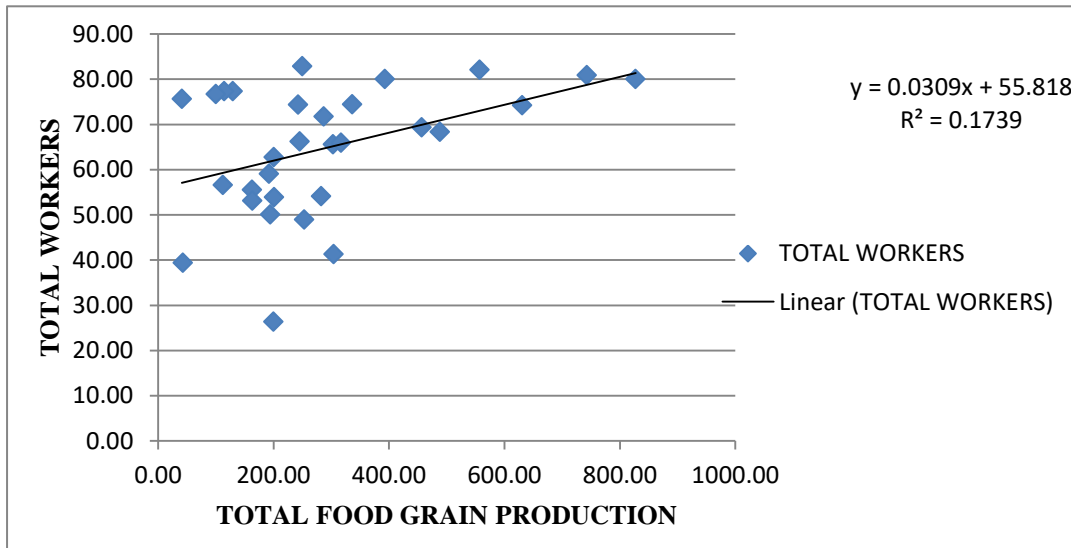


Fig. 4.2.2.4 Linear regression of Total workers and maize productivity in 2001

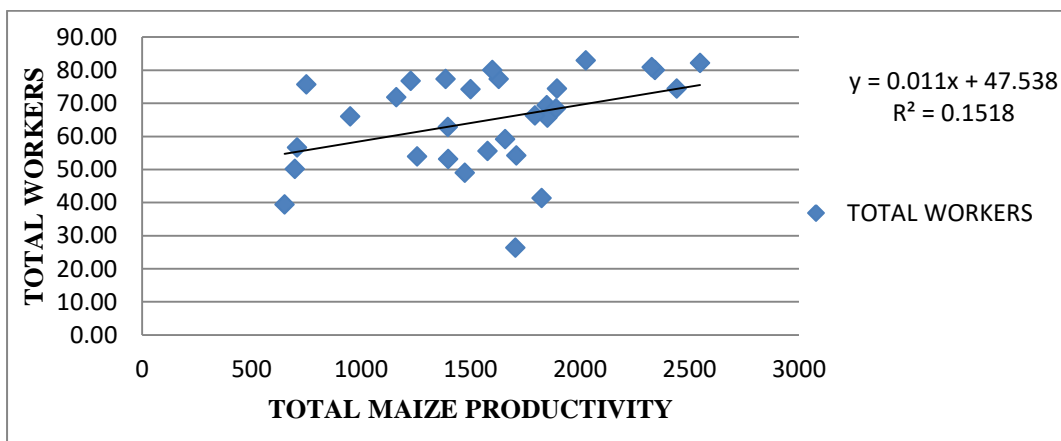


Fig. 4.2.2.5 Linear regression of Total workers and pulse productivity in 2001

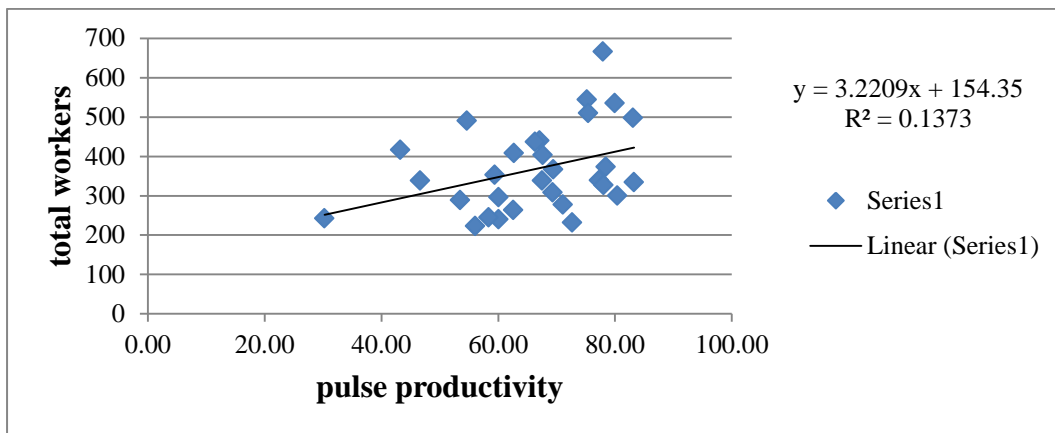
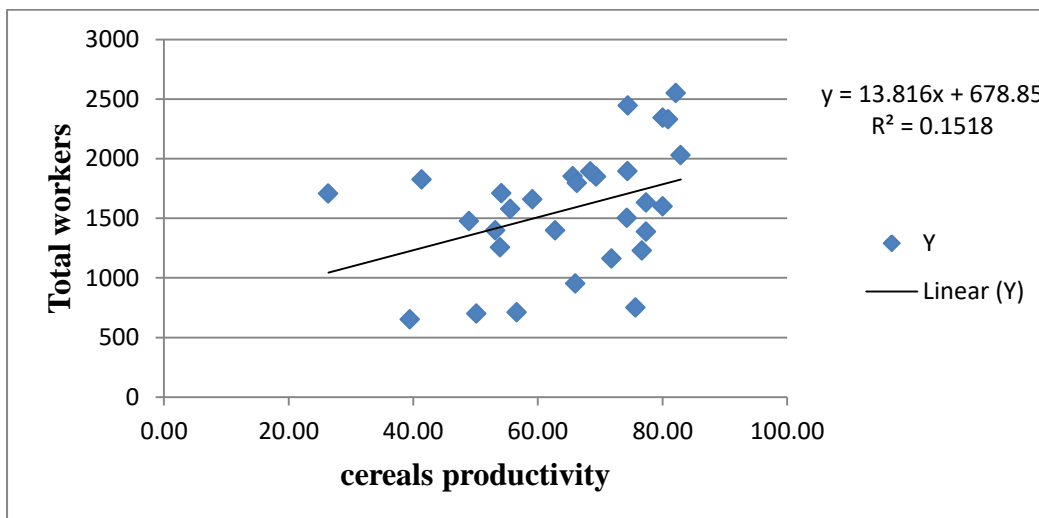


Fig. 4.2.2.6 Linear regression of Total workers and cereal productivity in 2011



4.3 To study the state wise scenario of gender participation using graphical and descriptive statistics

4.3.1 Status of work participation in agriculture

The figure 4.3.1 shows that trend of work participation from the years 1991, 2001 and 2011 has been increased both in rural and urban areas.

4.3.2 State wise scenario of work participation in agriculture

From the figure 4.3.5, 4.3.6, and 4.3.7 the agricultural workers out of total workers shown in the year 2001 and 2011 observed that Chhattisgarh has higher percentage of (74.68) per cent of total work participation in which male are (66.84) per cent and female are (85.77) per cent in agriculture. Bihar also has high work participation rate (73.55) per cent and 76.04 per cent in the year 2011

Chandigarh has (1.06) per cent of total work participation and (1.06) per cent under male and (1.02) per cent under female has lowest work participation.

In the year 2001 the Chhattisgarh highest work participation is seen with total (77.25) per cent in which male has (74.15) per cent and female has (85.75) per cent and the lowest work participation is seen in Chandigarh of (0.79) per cent total and (0.702) per cent of male participation and (0.99) per cent in female.

Among all the states and Chhattisgarh has highest percentage of work participation and Chandigarh and Delhi have lowest work participation percentage in India.

4.3.3 Total population involved in agriculture

From the figure 4.3.2 total population involved in agriculture are agricultural labours and cultivators of which agricultural labours are (54.8) per cent involved in agriculture of which rural are (49.9) per cent and (63.08) per cent are urban in 2011. In the year 2001 the agricultural labours are (45.1) per cent in which rural constitute (40.16) per cent and urban has (54.1) per cent. Cultivators in the year (2001) total are (45.15) per cent and (50.01) per cent are from rural areas and (36.92) per cent are urban and in the year 2011 (54.39) per cent

are constituted totally with rural (59.84) per cent and (45.87) per cent in urban areas. This shows that there is a tremendous increase in population involved in agriculture from the year 1991 to 2011

4.3.4 Total agricultural workers from the total workers

From the figure 4.3.3 total agricultural workers in the year 1991 rural areas constitute (18 million) male workers and (25 million) female workers. From the year 2001 there is an increase of agricultural workers from total workers (138 million) and (85 million) are male and female workers and in the year 2011 (158 million) and (98 million) are male and female workers. In urban areas workers from 1991 to 2011 are 0.5 million to 10 million

4.3.6 Work participation of men and women as cultivators and agricultural labours.

From the figure 4.3.4 shown that the work participation of men and women as cultivators and agricultural labours in the year 2011, 2001 and 1991 were observed in the year 1991 cultivators under rural areas having (5 million) male and (14 million) female workers and agricultural labours having (13 million) male and (14 million) female worker. Cultivators and agricultural labours increased from the year 2001 and 2011 are (83 million) male workers and (41 million) female workers in rural areas whereas, cultivators in rural areas (54 million) male workers and (47 million) are female workers In the year 2011 cultivators under rural areas having (79 million) male workers and (35 million) female workers and in agricultural labours males are (77 million) and (59 million) as female workers.

Fig 4.3.1 Trend in agricultural workers

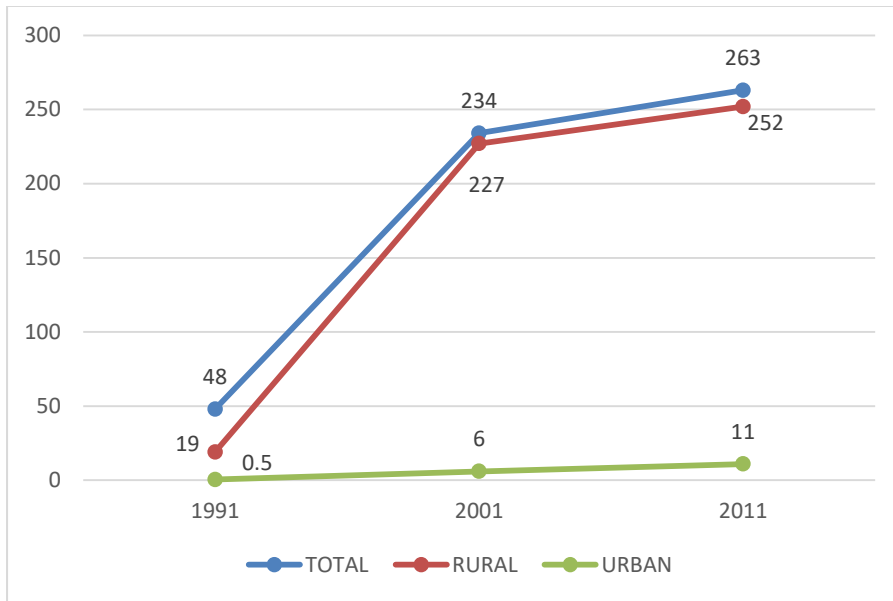


Fig 4.3.2 Total population involved in agriculture

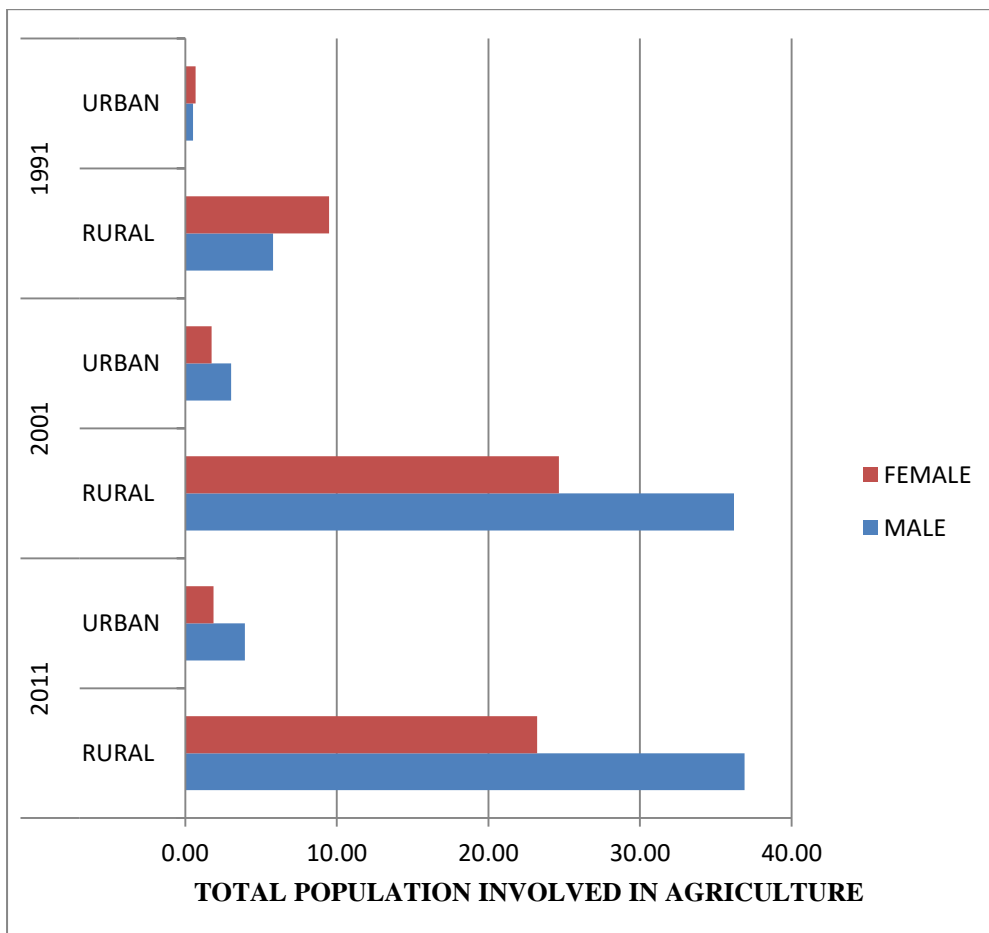


Fig 4.3.3 Total agricultural workers in India

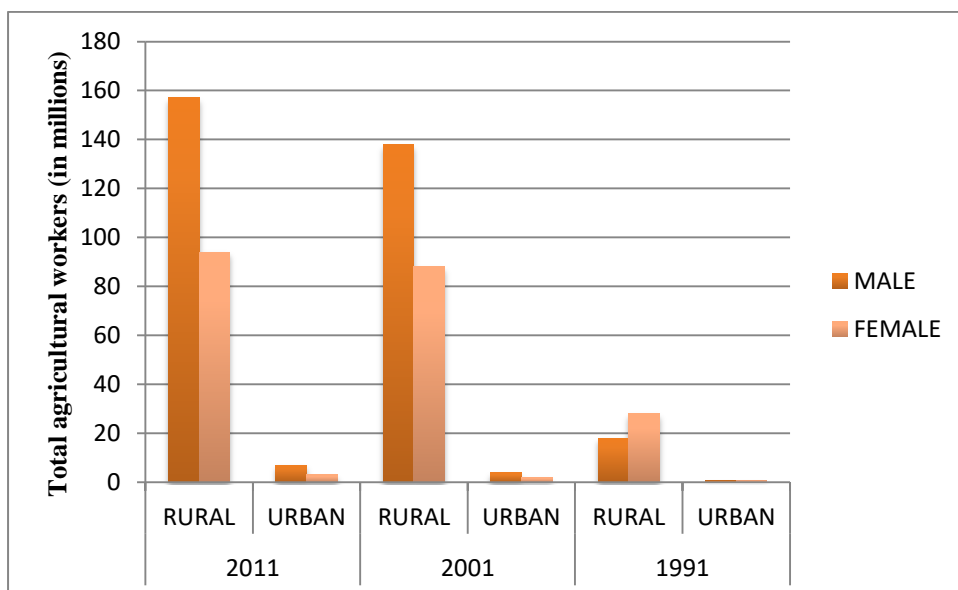


Fig 4.3.4 Work participation of men and women as total cultivators and agricultural labours

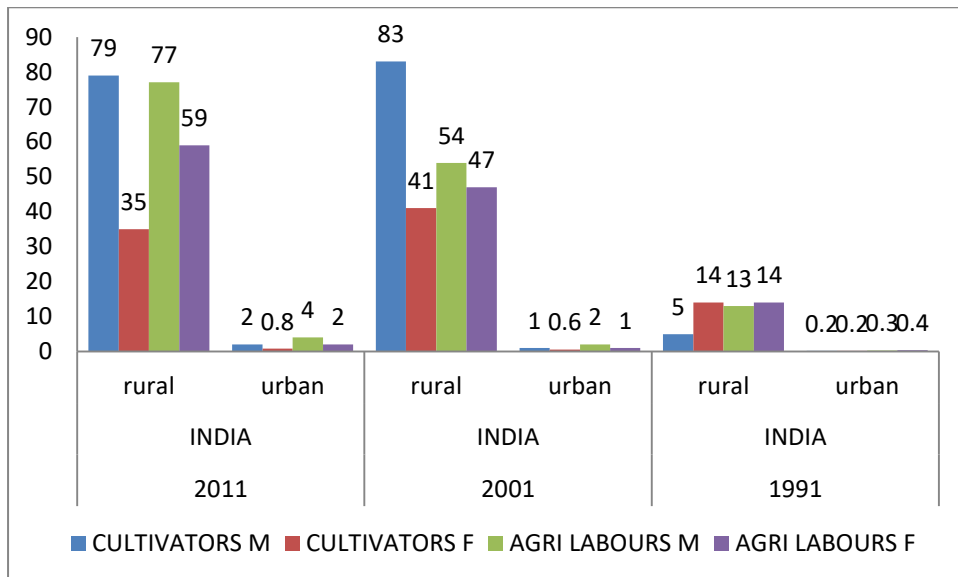


Fig 4.3.5 State wise scenario of work participation men and women in India in 2011

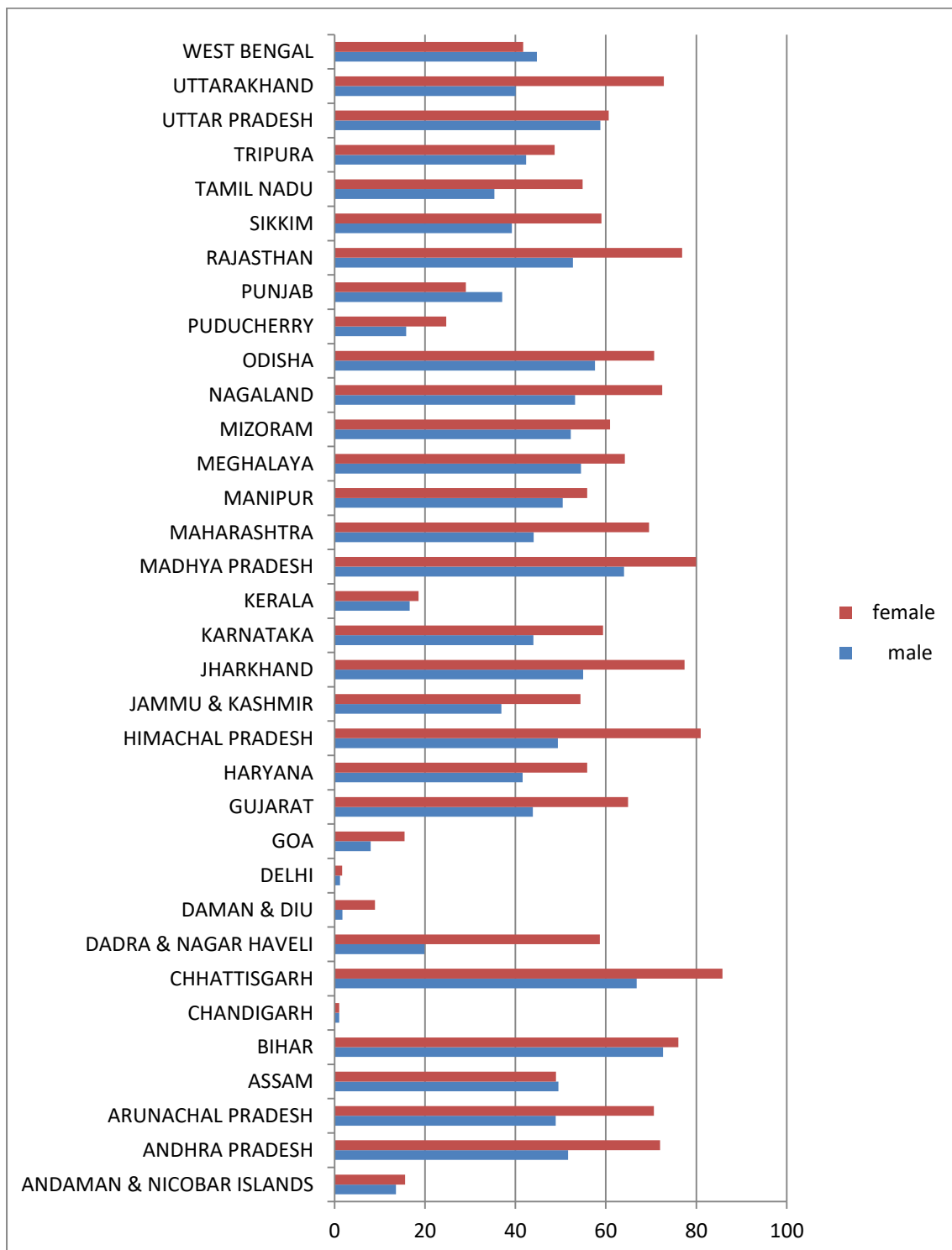


Fig 4.3.6 State wise scenario of work participation men and women in India in 2001

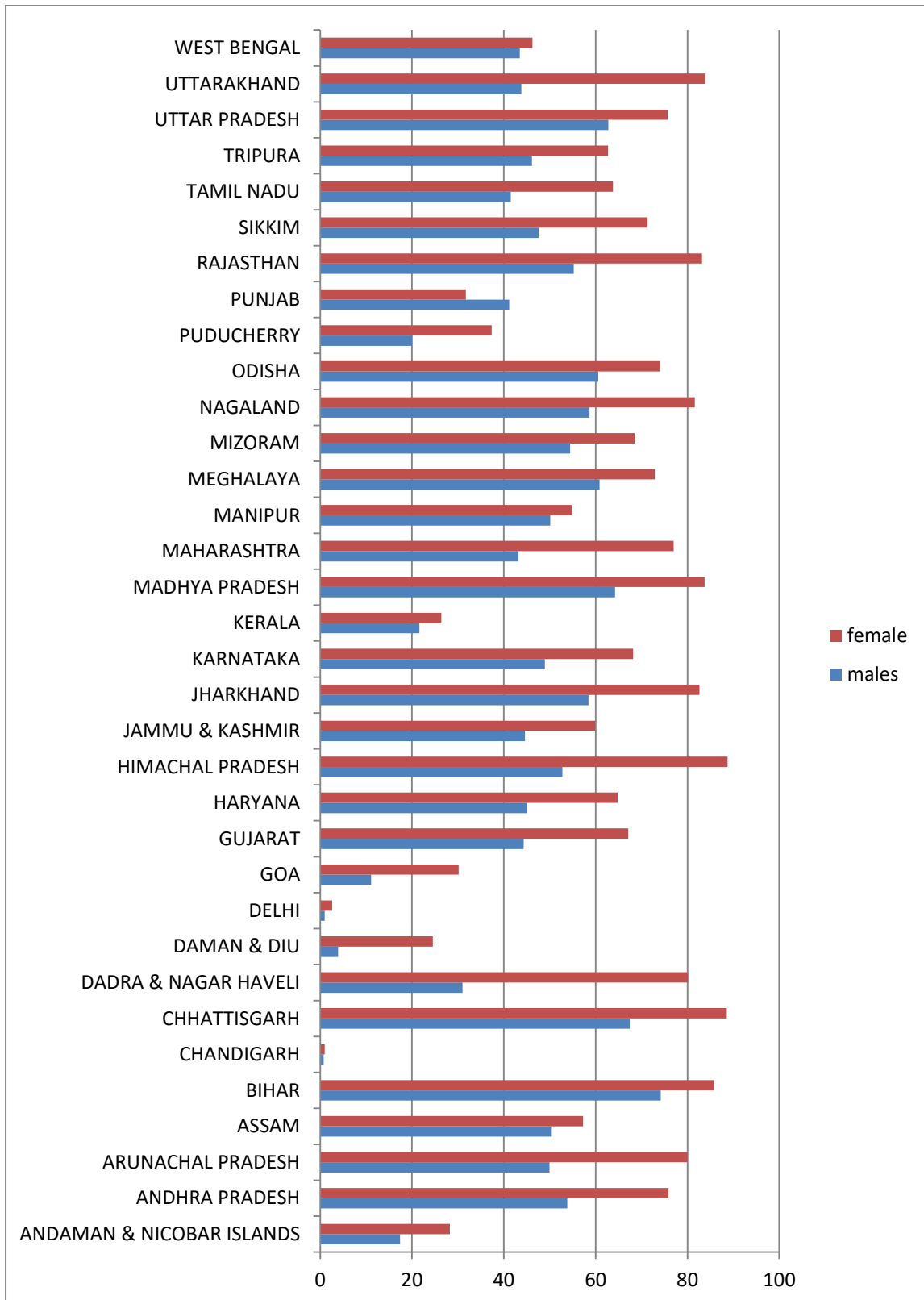


Fig 4.3.7 State wise scenario of work participation in India in 1991



DISCUSSION

The results presented in the previous chapter have been discussed in this chapter under the following objectives.

- To study the district wise scenario of gender participation in agriculture in Odisha using graphical and descriptive statistics
 - To study the effect of work participation of men and women in agricultural production in Odisha by linear regression model
 - To study the state wise scenario of gender participation using graphical and descriptive statistics

5.1 Status of work participation in different states in India and Odisha

Statistical tools *viz.*, graphical and descriptive statistics are used to study the status of migration in different states in India from 1991 to 2011

5.1.1 Trend of total work participation

The study shows continuous raise in trend of total work participation in India from 1991 to 2011. In rural and urban areas in Odisha has continuously raised due to which the area, production increase the work participation has raised and also the men migrate in search of work in urban areas the work participation in agriculture has increased

5.1.2 Total Population involved in agriculture

From the figure 4.1.2 Work participation of the total cultivators and agricultural labours belonging to marginal and main workers are involved over the total population involved in agriculture has been observed that in 1991 the workers higher among males in rural areas and less in urban areas and females in rural areas and In the year 2011 and 2001 observed is the male and female work participation male and are female in both rural areas and urban areas remained the same.

5.1.3 Work participation of men and women as cultivators and agricultural labours

The relationship between the men and women as cultivators and agricultural labours during the years 2001 and 2011 are compared with shows that the cultivators and agricultural

labours in 1991 male cultivators are 4 million and male agricultural labours are 1 million in the year 2001 the male cultivators observed are 3 million and agricultural labours are 2 million in rural areas .In the year 2011 cultivators and agricultural labours are 3 million both in male as well female in rural areas all the three years female work participation is less than 0.5 million in urban areas this showed that agricultural labours are more among females and less in males in both odisha and India

5.1.4 State wise scenario of work participation in agriculture

From the figure the agricultural workers out of total workers shown in the year 2001 and 2011 are observed In the year 2011 that Himachal Pradesh has total work participation of Among all the states Himachal Pradesh and Chhattisgarh have highest percentage of work participation and Chandigarh has lowest work participation percentage of which is the lowest in India.

5.2 Relationship of work participation and agricultural production in Odisha

The simple linear regression model were used to study the relationship of agricultural work participation on agricultural production in Odisha in 2001 and 2011, which explains the variation in dependent variable due to independent variables. The findings concluded that for mostly the work participation is dependent up on the agricultural production in mostly in cereal production, food grain production. For all important crops and crop groups (maize , cereal production ,food grain, states with more area or production Production does not significantly depend on the number of workers. This might be because on various other factors such as area for production is increased then the work participation can also be increased.

SUMMARY AND CONCLUSION

As per the Census 2001, Indian workforce is over 400 million strong which constitutes 39.1 percent of the total population of the country. The workers comprise 312 million of main workers and 88 million of marginal workers (i.e., those who did not work for at least 183 days in the preceding 12 months to the census taking) whereas sex differential among the number of male and female worker in the total workforce is significant that the total 402 million workers, 275 million are males and 127 million females. It means that 51.7 percent of the total males and 25.6 percent of the total females are workers.

In Odisha, according to 2011 census 61.8 percent of total workers are engaged in agriculture. And the percentage of agricultural labourers among total women worker is 57.8 percent Odisha economy is agro-based and a major proportion of women in the labour force work in agriculture. A significant proportion of the labour force in the agricultural sector comprises women. In Odisha, more than 60 percent of the total workforce is directly dependent on agriculture. According to 2001 census, out of the total male work force 34.15 percent were male cultivators and 26.39 percent were agricultural labourers, whereas, the female cultivators and agricultural labourers accounted for 20.11 percent and 53.90 percent of the total female workforce respectively.

Keeping in view the consequences effecting the work participation are studied as follows

- 1.To study the district wise scenario of gender participation in agriculture in Odisha using graphical and descriptive statistics

- 2.To study the effect of work participation of men and women in agricultural production in Odisha by linear regression model

- 3.To study the state wise scenario of gender participation using graphical and descriptive statistics

Data source and analytical techniques:

The secondary data regarding work participation of cultivators and agricultural labours of total agricultural workers, total population involved in agriculture were collected from census of India 1991, 2001 and 2011 and area, production and productivity of major crops data were collected from the “Hand book of agricultural statistics of Odisha 2010-11”. Various statistical tools like graphs and descriptive statistics were used to study the status of work participation in different states in India and Odisha and also linear regression model were used to analyze the significant relationship between work participation and agriculture production.

Major findings of study are as follows:

The trend of total workers in Odisha. The raise in number of workers from the year 1991 (8 million) to 2011 (10 million) in both rural and urban were noticed. More number of agricultural workers are observed in rural than in urban and the participation of the total cultivators and agricultural labours belonging to marginal and main workers over the total population involved in agriculture has been observed from 1991 to 2011 but the male workers were decreased from (43.65 per cent) to (38.20 per cent) in the year 2011 in rural areas and the female workers were increased up to (22.62 per cent) the year 1991 to 2011 in the rural areas

In 1991 the work participation is higher in Koraput district and lowest in Cuttack and the in the year 2001 the work participation is higher in Gajapati district where as Khorda district has low work participation compared to 1991 and 2001 the workers are increased in agriculture in 2011

The relationship between the men and women as cultivators and agricultural labours during the years 1991 and 2011 are compared with shows that the cultivators from 1991 male cultivators decreased from (4 million) to (3 million) in rural areas and female cultivators are decreased from (0.8 million) to (0.7 million) in 2011.

In case of agricultural labours male and female in 1991 are increased from (1 million) to (3 million) in the year 2011 and in urban areas male workers remain the same but females increased from (0.03 million) to (0.04 million)

The Linear regression analysis was also done with all major crops such as cereals, food grains production showed significant but the total pulses production, oil seeds production and the result was non significant from the year 2011 and 2001 represented that production does not depend up on the work participation .

Population involved in agriculture are agricultural labours and cultivators of which agricultural labours are 54.8percent is the total percentage involved of which rural are 49.9 per cent and 63.08 per cent in 2011. In the year 2001 the agricultural labours are 45.1 per cent in which rural constitute 40.16 per cent and urban has 54.1percent. In cultivators in the year 2001 total are 45.15 per cent and 50.01 per cent are from rural areas and 36.92 per cent are urban and in the year 54.39 per cent are constituted totally with rural 59.84 per cent and 45.87 per cent in urban areas the agricultural workers out of total workers shown ,in the year 2001 and 2011 are observed that Bihar has 73.55 per cent and Chhattisgarh has higher percentage of 74.6 8 per cent of work participation in agriculture in which Chandigarh has lowest worker percentage 1.06 per cent in 2011 and in the year 2001 Bihar has 77.25 percent and Chhattisgarh has higher percentage of 76.47 per cent with the lowest work participation state is Chandigarh 0.79 per cent work participation of men and women as cultivators in 2011 are 79 million male in rural areas and 83 million male in rural 2001in which males in agriculture labours are 77 million in 2011 in rural area and 59 million as males in 2001. In the year 2011 females as cultivators are 35 million and 41 million cultivators are female. Where as in agricultural labours 59 million and 49 million are females

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